

Gain Measurements on a Prototype NIF/LMJ  
Amplifier Pump Cavity

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We are currently developing large-aperture amplifiers for the National Ignition Facility (NIF) and Laser Megajoules (LMJ) lasers. These multi-segment amplifiers are of the flashlamp-pumped, Nd:Glass type and are designed to propagate a nominally 36 cm square beam. The apertures within a particular amplifier bundle are arranged in a four-high by two-wide configuration and utilize two side flashlamp arrays and a central flashlamp array for pumping. The configuration is very similar to that used in the Beamlet laser, a single-beam prototype for the NIF/LMJ lasers, which has four apertures arranged in a two-high by two-wide configuration.

In designing these amplifiers, one of the more important criteria is the layout and composition of the pump cavity. The pump cavity consists of the laser slab, blast shields, flashlamp cassettes, and any high-reflectivity components that may be used. The current pump cavity design for the NIF/LMJ lasers is in many respects very similar to that of the Beamlet laser: Brewster-angle laser slab, central and side flashlamp cassettes, and top and bottom reflectors (in both the flashlamp cassettes and in the slab cassette). However, there are a number of important differences between the two amplifiers. The NIF/LMJ amplifiers will use 180 cm arc-length, 4.3 cm bore-diameter flashlamps as opposed to the 91 cm arc-length, 2.5 cm bore diameter flashlamps used on Beamlet. In addition, in the NIF/LMJ lasers there will be eight lamps in the central lamp array and six lamps in the side lamp array, *vs* 16 lamps in the central array and 10 lamps in the side array on Beamlet. Finally, the NIF/LMJ flashlamp pulsewidth will be 360  $\mu$ s as compared to 550  $\mu$ s on Beamlet.

To understand the effect of these differences, we performed a series of experiments in order to characterize the optical performance of the amplifier. These experiments were done on a Beamlet amplifier that was modified to accept the different-sized flashlamps. In addition, our pulsed-power bank was modified to produce the 360  $\mu$ s pulsewidths needed.

We will present results regarding the full-aperture gain distribution and the effect of pre-pulse conditions on flashlamp pumping efficiency. We also investigated the possibility of steering the pump light to selected regions of the laser slab. We will show that this can ameliorate the effects of amplified spontaneous emission on gain uniformity.